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ABSTRACT

The predictive validity of the revised Graduate Record Examination Analytical Test (GRE-A) was compared with the experimental form of the GRE-A, in terms of graduate school admissions as well as advancement to Ph.D. candidacy decisions. Prior to 1974 the Graduate Record Examination included just a verbal and a quantitative test; in 1974 it was broadened to include an analytical component to meet a preceived need. For 407 students applying for admission to a graduate program in educational psychology, the following data were analyzed: GRE scores (verbal, quantitative, and analytical); sex; ethnic status; area of specialization; faculty evaluation of Ph.D. qualification; and demographic data. Regression analysis of the GRE scores indicated that this combination of independent variables accounted for a significant variance associated with admissions decisions, whether the experimental or the revised GRE-A was used. Verbal and quantitative scores accounted for more variance than analytical scores did. The analytical scores were strongly related to scores on both of the other sections. The GRE-A was also found to add to the prediction of advancement to Ph.D. candidacy. This was true for both the experimental and revised GRE-A forms. It was concluded that the GRE-A had predictive utility and that both the experimental and revised forms were comparable. (GDC)

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COMPARATIVE VALIDITY OF THE GRE-ANALYTICAL TEST*

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The academic ability domains of verbal (V) and quantitative (Q) aptitude have been the traditional focus of the GRE Aptitude Test. These two constructs have been both logically and empirically related to academic performance (Powers & Swinton, 1981; Willinghamn 1974, 1976; Wilson, 1979). The GRE was designed to measure these constructs and as such has been used extensively as a selection tool for admission to graduate education programs. The GRE Aptitude Test was broadened in 1974 to include an analytical component due to a perceived need (Altman, Carlson, & Donlon, 1975). After extensive testing, a final revision of the GRE Analytical Test (GRE-A) was made operational during the Fall 1981 (GRE Newsletter, 1981). It was believed that broadening the GRE Aptitude Test to include an analytical component would allow potential graduate students to demonstrate their range of analytical reasoning and logical thinking skills which were believed to be necessary for success in graduate education (Altman, Carlson, & Donlon, 1975; Wild, Swinton, & Wallmark, 1982). The resulting item sets (Powers & Swinton, 1981; Wilson, 1982) seem logical in their importance to graduate education in general. More specifically, they seem

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to be important attributes of Ph.D. level scholars. Mowsesian & Hays (1982, 1984) found that the GRE-A, experimental form, did contribute and added to the accounted for variance for both admission to graduate school as well as advancement to Ph.D. candidacy decisions. They suggested that the revised GRE-A, instituted in late 1981, had the potential to become an important addition to the GRE Aptitude Test.

Problem

The purpose of this study was to compare the predictive validity of the revised Graduate Record Examination Analytical Test (GRE-A) with the experimental form of the GRE-A for graduate school admissions as well as advancement to Ph.D candidacy decisions. This study is both a continuation of and a comparison with studies previously reported by Mowsesian & Hays (1982, 1984) and part of a longitudinal within institution effort of the variety called for by the GRE Board Research Committee (Willingham, 1976). This study was designed to replicate the two previously reported studies by Mowsesian and Hays as well as to compare the predictive efficiency of the revised GRE-A to the experimental virsion. The following questions were formed to address the comparitive issue.

1. How efficient is the revised GRE-A as a predictor

for graduate school admissions and advancement to Ph.D candidacy decissions when used in combination with the GRE-V, GRE-Q, GPA, and the GRE Advanced Psychology Test when available?

2. Does the revised GRE-A predict graduate school decision-making in the direction suggested by the results observed with the GRE-A experimetnal form as well as add an equal amount of incremental prediction?

It was assumed that if these questions were answered affirmatively, then support for including the GRE-A as part of graduate school decision-making would be warrented. Further, affirmative findings may be suggestive of more efficient utilization of quantifiable predictors both within departments and programs as well as across similar programs within a given institution.

Methodology

Graduate Record Examination Aptitude Scores (V,Q,A), sex, ethnicity, area of specialization, faculty evaluation in a Ph.D. qualification proceedure for a sub-set (N = 42), as well as the usual demographic data were gathered on all subjects (N = 407) making application for admissions to the Department of Educational Psychology at The University of Texas at Austin during Spring 1982 and 1983. These applicants comprised the primary data pool to address the

comparison questions. The results observed from the analysis of their data were compared to similar data gathered during Spring 1980 and 1981. The results observed from an earlier data pool (N = 446) were reported by Mowsesian & Hays (1982, 1984). An examination of the current data reveals that of the 407 applicants 279 sought entry into the Counseling Psychology program, 52 to School Psychology, 14 to Area I (Learning, Cognition, and Motivation), 51 to Area II (Human Development, Social Psychology, and Personality) and 11 to Area III (Quantitative Areas). The 1982 - 1983 applicants seeking entry to the more professionally oriented programs were proportionately similar to the previous sample with whom they are compared.

A total of 93 subjects were admitted and began attending various departmental programs across the two years of data gathering, 42 in 1982 and 51 in 1983. This is up from a total N of 64 for the previous studies. The 1982 data are utilized for the advancement to Ph.D. candidacy question. Only subjects with complete data (N = 13) were used to answer this question. Since the GRE-A was never part of the admission decision and the GRE Board requested that the experimental form be omitted in such decisions, it may be assumed that these data were available but not included in final decision-making. However, the GRE - A was available to the various decision-making bodies during both data gathering periods, thus, there is no assurance nor is there any way to

accurately check that the A score did not influence final decisions.

The sample size seeking admission to the departmental graduate programs was felt to be sufficiently large to test the relevant questions and to allow for a reasonable level of confidence in generalizations made about future applicants to the Educational Psychology Program. An inspection of the application forms indicate that the geographical distribution of the potential student pool represented all regions of the United States as well as several foreign countries. The nature and extent of this cross-national and cross-cultural influence suggests that these applicants are representative of graduate student applicants to other similar programs in the United States. This enhances the possibility of generalizing these findings to other potential applicants to graduate programs in educational psychology. The 1982 sample size used in addressing the advancement to Ph.D. candadicy decisions may be questioned. Only cumulative data, gathered over time, will provide a normative base upon which generalizations regarding such decisions may be made. Regardless, we feel that our current data pool is of sufficient size and diversity to allow us to speculate as to the degree of contribution the GRE-A makes to advancement to Ph.D. candadicy decisions. Further, the very size of this graduate program suggests that most programs will be hard pressed to conduct similar research which would allow for

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within department as well as cross institutional comparisons. At best, we will assume that our data are suggestive of what may be, subject to long term data gathering and analysis, and are in keeping with institutional studies called for by the GRE Board Research Committee (Willingham, 1976). Instituional studies, by their very nature, often are comprized of small N's. With these thoughts and cautions in mind, it is felt that the sample size used to address the advancement to Ph.D. candadicy questions is reasonable and representative of a multifacted educational psychology department and allows for a reasonable level of confidence in our findings.

The questions of interest were tested through use of standard multiple regression techniques. The specific regresson analyses utilized are listed in the SPSS Manual (Nie et al., 1977). Correlational and descriptive data analyses were also utilized in an effort to show relationships and describe our data more completely.

Results

The predictive efficiency of the Analytical Score for graduate admissions when compared to the predictive efficiency of the Verbal Score, Quantitative Score, and undergraduate GPA was the first question of concern. The dependent variable (i.e., a dummy variable) was whether or not the applicant was admitted to the graduate program in Educational Psychology. A regression analysis on the independent variables (GPA, V, Q, and A) for the 1982 - 1983

data yielded an R^2 = .13. This R^2 was found to be significant ($p < .0001$) indicating that this combination of independent variables accounted for a significant portion of the variance associated with admissions decisions. This finding was similar to that found with the 1980 - 1981 data which used the experiemental form of the GRE-A.

The unique contribution of each independent variable to the accounted for variance for both groups is listed in Table 1. As can be seen for both groups, the Analytical Score adds the least amount to the explained variance whereas the GRE-Q adds most to the variance accounted for in the early sample and the GRE-V adds the most in the later sample. An examination of the correlations for both groups, presented in Table 2, suggests that the Analytical and Verbal and Analytical and Quantitative sections of the GRE Aptitude test have a stronger relationship to each other than do the other variable combinations. One may conclude that on the bases of the data gathered from these two groups, the GRE-A regardless of its form is about equal in its predictive efficiency and that the GRE-A, whatever it purports to measure, has much in common with V and Q. It also might be concluded that while the Analytical Score when used in combination with V,Q, and GPA contributes little to the predictive efficiency for admission to graduate school that independently the Analytical Score can be useful as an independent predictor about as well as Verbal or Quantitative when they are

unavailable. Mowsesian and Hays (1982) found this to be the case when examining foreign student scores for admission decisions.

INSERT TABLES 1 & 2 ABOUT HERE

The second part of our first questions concerns decisions on advancement to Ph.D. candidacy. The unique combination of dependant variables reported in Table 3 suggests that for the 1980 - 81 group the total R^2 is .241 with the GRE-A contributing an R^2 of .032. With the exception of the added dependant variable of the Advanced Psychology, the R^2 for the unique combination of the same dependant variables for the 1982 - 83 group is about the same, .242. The Advanced Psychology Score adds an R^2 of .075 increasing the total R^2 to .317. This suggests that regardless of the GRE-A form used, experimental or revised, its contribution to the prediction for advancement to Ph.D candadicy is about the same order. The fact that the GRE-A is one of the set independant variables accounting for the known variance tends to support the conclusion that it continues to add a small amount to prediction in an incremental sense. This last observation tends also to support our second question. The revised GRE-A does add to prediction in the direction suggested by the experiemental form.

Insert Table 3 about here

A question frequently rasied concerns sex and ethnic differences. Mowsesian and Hays did observe some differences

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in their 1980 - 1981 data. The major differences were observed between foreign student applicants on the verbal score (lower than whites or minorities) which was expected, minorities scoring lower on the quantitive score, and mixed results between foreign and minority students on the analytical score. On all three variables white students scored consistently higher than did minority students, with foreign students scoring higher than both whites and minorities on the quantitive score. A similar observation was made for the 1982 - 1983 data on students who enrolled. (See Table 4 and 5) Means and standard deviations are of the same order as those previously reported by Mowsesian and Hays. Sex differences observed among the 1980 - 1981 group were also about the same for the 1982 - 1983 group. There is an apparent consistency of response pattern by sex and ethnicity, regardless of test form or time of administration. Further research will be needed in an attempt to bring some clarity as to the meaning of these observations.

Insert Table 4 and 5 about here

Conclusions

To the extent that the GRE - A experimental and revised forms are compariable, this study's questions are answered affirmatively. Both forms were found to contribute both to admissions as well as to advancement to Ph.D candadicy decisions, and to a similar degree. It was hoped that the revised GRE - A would stand out more in its contribution.

However,in this case it did not. One possible explaniation is that the analytical score was not considered as part of decision-making; hence the equivocal evidence for its inclusion as part of the admissions and advancement to candadicy process. One can only speculate about its predictive efficiency were it to be treated on a par with V and Q in the process, especially for admission to a graduate program.

One thing in this study that is different from the earlier studies is that admissions as well as candadicy decisions do appear to have a verbal as well as a quantative component. The current study suggests that both verbal and quantitive components are included as part of the GRE - A for those subjects evaluated as part of the advancement to candadicy process. (See Table 6) Our earlier studies suggested A to be independant of Q but related to V. Such a relationship, should it emerge consistently over time, might imply that A could be useful for decisions effecting minorities as well as foreign students. Both this study as well as an earlier study suggest that these groups display wide variations on the GRE performance. It may emerge that the GRE - A will become a more efficient predictor, at least for such admissions decisions, than will V and Q.

Verbal fluency and quantitative skills are certainly important preresqusites for admission to graduate school and advancement to Ph.D candadicy in a research oriented

educational psychology department. In and of themselves they do not appear to be sufficient. The completion of a Ph.D. is more than skill mastery. It requires independent thinking, analytical reasoning, an ability to communicate both verbally and in writing, and a degree of creativity in addition to a strong knowledge and skill base. The GRE - A was designed to tap these factors. What is in question is the precision with which it does this. Unfortunately, this investigation could not attempt an independant assessment of the very attributes the GRE - A was designed to assess. Such an investigation is yet to be conducted.

Inset Table 6 about here

It should be recognized that in no way has this study attempted or presumed to predict retention in or graduation from a Ph.D. program of study. This was not our intent, but such questions seem to be worthy [redacted] of future investigation. Even though we must be cautious about our findings to date, we feel that such investigations are relevant. In times of austere budgets, limited resources, reductions in program expansion, and pressures from more and more applicants to Ph.D. programs, it does seem important to make the best and most informed decisions as possible which utilize all available data. Willingham (1976) reminded us that being concerned about selection of graduate students is of far greater concern now than in the past since many more students are involved. Given the current social climate, it

behooves those of us who are charged with making admissions and advancement to Ph.D. candadicy decisions to make every effort to reduce ambiguities in our decision-making insofar as possible. Given the nature of our findings, it does seem that the addition of the GRE - A to the GRE Aptitude Test is a move in the direction of more informative decision-making.

Finally, although this study does not firmly establish the GRE - A as an independant predictor for decision-making purposes, it does suggest the following. First, the revised GRE - A appears to be comparable to the experimental form as has been reported in this current series of studies. Second, it affords sufficient evidence regarding the utility of the GRE - A as a predictive measure to warrent continued use of this score in combination with the usual predictor variables. It especially seems to have some potential utility when used in making decisions regarding the admission of foreign and minority students who might otherwise be overlooked when predictor variables are limited to information only dimensions. Last, reporting these results are in keeping with the GRE Board Research Committee's recommendations with regrad to institutional studies using the GRE Aptitude Tests (Willingham, 1976). More studies similar to this one are needed in order to examine questions of validity, methodological issues, success criteria, retention in and advancement through programs of study, and the like. It is in this way that we will be bringing more precision to our

decision-making process.

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TABLE 1

R^2 for Each Independent Variable by Order of ~~Contribution~~ Inclusion to Admission Decision 1980-81 vs 1982-83

1980-81 (N = 446)			1982-83 (N = 339)		
Independent variable	R^2	R^2 change	Independent variable	R^2	R^2 change
GPA *	.0219	.0219	GPA	.0369	.0369
GRE-Q	.1175	.0955	GRE-V	.1054	.0684
GRE-V	.1512	.0337	GRE-Q	.1210	.0157
GRE-A	.1516	.0004	GRE-A	.1271	.0061

*undergraduate GPA used throughout.

TABLE 2

Correlation of Independent Variable

1980-81 vs. 1982-83 Applicants

	1980-81 (N = 446)				1982-83 (N = 339)			
	GPA*	V	Q	A	GPA	V	Q	A
GPA	—	.19	.11	.24	—	.16	.20	.26**
V		—	.28**	.62**		—	.33**	.47**
Q			—	.54**			—	.55**
A				—				—

**p < .01

*undergraduate GPA used throughout.

TABLE 3

Regression on GSC Action for Each Indepent Variable

1980-81 vs 1982-83

	1980-81 (N = 48)			1982-83 (N = 15)		
Independent variables	R^2	R^2change	P	R^2	R^2change	P
GPA *	.193	.193	.002	.001	.001	.924
GRE-A	.225	.032	.180	.026	.025	.739
GRE-Q	.237	.013	.396	.230	.204	.213
Adv. Psy	Not Available			.305	.075	.381
GRE-V	.241	.004	.654	.317	.012	.739

*undergraduate GPA used throughout.

Table 4

$\bar{X}$ & SD for 1980 and 1981 Ss
Admission Status x Sex x Ethnicity

		Admit				Deny				
		Male		Female		Male		Female		P
GRE Verbal										
W*	$\bar{X}$	612.50	(64)	611.70	(94)	545.91	(93)	542.57	(109)	
	SD	85.88		85.24		87.16		101.98		
F	$\bar{X}$	443.55	(6)	383.64	(11)	354.29	(7)	329.29	(14)	< .0001 Eth.
	SD	148.55		102.30		93.96		67.19		< .0001 A/D
M	$\bar{X}$	446.25	(8)	532.31	(13)	452.00	(10)	427.50	(16)	
	SD	85.85		95.45		102.29		106.24		
GRE Quant.										
W	$\bar{X}$	634.38	(64)	573.51	(94)	545.48	(93)	513.57	(109)	
	SD	73.42		79.33		80.60		102.16		< .007 Sex
F	$\bar{X}$	661.67	(6)	619.09	(11)	567.14	(7)	571.43	(14)	< .0001 Eth
	SD	136.74		135.97		157.13		156.00		< .0001 A/D
M	$\bar{X}$	516.25	(8)	479.23	(13)	457.00	(10)	385.63	(16)	
	SD	105.96		56.93		119.08		101.06		
GRE Analytical										
W	$\bar{X}$	627.11	(45)	615.29	(70)	557.07	(75)	545.61	(82)	
	SD	73.41		69.62		92.57		101.95		< .0001 Eth
F	$\bar{X}$	546.67	(6)	469.09	(11)	360.00	(6)	492.31	(13)	< .0005 A/D
	SD	125.80		85.02		70.14		105.68		< .0006 Sex x Eth x A/D
M	$\bar{X}$	425.00	(8)	516.25	(8)	446.25	(8)	451.00	(10)	
	SD	110.71		89.27		116.98		124.49		

*W = White F = Foreign M = Minority. Number of cases in parenthesis.

NOTE: The size of N for A does not correspond to V and Q due to the fact that not all applicants reported an A score.

TABLE 5

$\bar{X}$ & SD for 1982-83

Admission Status X Sex X Ethnicity

		Admit		Deny		
		Male	Female	Male	Female	p
GRE Verbal(V)						
W	$\bar{X}$	609.31(58)	634.62(91)	567.21(111)	544.30(107)	
	SD	89.81	80.05	89.36	89.93	
F	$\bar{X}$	420.00(2)	408.89(9)	416.00(5)	403.75(8)	<.001 Ethnicity
	SD	56.57	119.63	135.76	99.85	<.001 A/D
M	$\bar{X}$	476.67(3)	520.00(5)	380.00(5)	476.67(3)	<.024 Ethnicity X A/D
	SD	60.28	104.88	114.24	47.26	
GRE Quantative (Q)						
W	$\bar{X}$	620.86(58)	590.88(91)	588.02(111)	518.97(107)	
	SD	75.82	67.42	99.04	97.87	<.001 SEX
F	$\bar{X}$	725.00(2)	608.89(9)	606.00(5)	518.75(8)	<.001 Ethnicity
	SD	106.06	61.53	60.25	136.64	<.001 A/D
M	$\bar{X}$	473.33(3)	484.00(5)	376.00(5)	420.00(3)	
	SD	155.67	90.17	158.52	87.18	
GRE Analytical(A)						
W	$\bar{X}$	611.43(49)	609.38(81)	555.78(90)	537.43(96)	
	SD	86.60	84.68	110.09	103.19	<.001 Ethnicity
F	$\bar{X}$	585.00(2)	501.43(7)	440.00(4)	495.00(6)	<.001 A/D
	SD	162.63	121.58	53.54	182.73	
M	$\bar{X}$	536.67(3)	522.00(5)	370.00(4)	500.00(1)	
	SD	130.51	136.64	121.93	NA	

*W = White, F = Foreign, M = Minority. N of cases in parenthesis

Note: The size of N for A does not correspond to V andQ since not all applicants reported an A score.

TABLE 6

Correlation of Independent Variables

Enrolled and Evalucated for PhD CAndidacy

1980-81 vs 1982

	1980-81 (N = 48				1982 (N = 13)				
	GPA *	V	Q	A	GPA	V	Q	A	Adv Psy
GPA	—	.20	.05	.19	—	-.05	-.16	.03	-.15
V		—	.14	.60*		—	-.51*	.70**	.46
Q			—	.21			—	-.12	-.05
A				—				—	.30

*p ≤ .05 **p≤.01 *Undergraduate GPA used throughout.